Parallel Monitoring Program
November 2, 2004
Preliminary Report of Findings[1]

Executive Summary

Introduction

The use of Direct Recording Electronic (DRE), including touch screen voting systems, gave rise to public concerns about the security of these systems. The principle concern expressed has been the possibility that unauthorized programmers could illegally manipulate the software that counts ballots on DRE equipment.

On April 30, 2004, Secretary of State Kevin Shelley directed that a county use no DRE voting system unless the county agreed to implement a series of security measures. One of the required security measures was the Parallel Monitoring Program (Program), originally proposed by his Ad Hoc Touch Screen Task Force appointed in February of 2003. The Program was first implemented in the March 2004 Presidential Primary Election.

Members of the Secretary of State Elections Division staff, along with independent consultants from the consulting firm of R&G Associates, LLC (R&G), developed the Program to implement the Secretary's directive. The Program provided for the random selection of DRE voting equipment to be set aside for use by experts voting on Election Day. Actual voting conditions were then simulated on Election Day to determine the accuracy of the machines to record, tabulate, and report votes.

Program Purpose

Current federal, state, and county accuracy testing of DRE voting systems occurs prior to elections and does not mirror actual voting conditions. The March Parallel Monitoring Program was developed as a supplement to the current logic and accuracy testing processes. The goal was to determine the presence of malicious code by testing the accuracy of the machines to record, tabulate, and report votes using a sample of DRE equipment in selected counties under simulated actual voting conditions on Election Day.

Notwithstanding this additional level of testing, it is acknowledged that there are forms of malicious code that could affect the accuracy of a voting system that would not be detected by federal, state, local or parallel testing. Other detection methods, such as the Accessible Voter Verified Paper Audit Trail (AVVPAT), are necessary to expose these types of election tampering.

[1] The final report of findings will be released by December 2nd.

The Program results provide a "snapshot" of a specific system's behavior on Election Day. Thus the value of the results is necessarily limited to the November 2, 2004 Election.

Program Scope

Eleven counties agreed to the conditions set forth in the Secretary's Directive and utilized DRE equipment for the November 2, 2004 election. Of these, one county—Los Angeles—was excluded from the Program because it used DRE equipment for early voting program and did not use DRE units in the precincts on Election Day.

The ten participating counties provided the opportunity to sample the four different DRE systems currently approved for use in California: Diebold AccuVote-TS, ES&S iVotronic, Hart eSlate and Sequoia AVC Edge.

Two DRE units were tested in each of the ten counties. Within each of the counties, one precinct was identified for testing purposes. The official ballot of the selected precinct provided the foundation for the development of test scripts used in that county. The ten counties selected for the Program were:

- Alameda
- Merced
- Napa
- Orange
- Plumas
- Riverside
- San Bernardino
- Santa Clara
- Shasta
- Tehama

Program Requisites

Security of the testing process in each of the selected counties was of paramount consideration. Thus to be successful, the Program required that:

1. The counties agree to the conditions set forth in the Secretary's Directive, dated April 30, 2004;
2. The counties agree to host testing teams on November 2, 2004;
3. Selection of voting equipment in each of the counties be randomly determined, utilizing random number generator computer software to eliminate human error or bias;
4. Voting equipment be fully operational, prepared for the November 2, 2004 Election by the county and accessible for selection prior to November 2nd and for testing on November 2nd;

5. A secure storage area be available at each county to house the selected voting equipment prior to November 2, 2004;
6. Tamper-evident, serially numbered security seals be placed on the selected voting machines;
7. A secure, appropriately equipped testing room be available at each county for the testing team on November 2, 2004;
8. A county representative be available to assist or provide guidance on logistical issues while the team was in the county prior to and on November 2, and;
9. Testing on November 2, 2004 be conducted by the testing teams without the involvement of voting system vendors.

Program Methodology

A test methodology was created to provide a framework for developing test scripts, defining the roles and training the testers, observers and team leaders, documenting testing activity and discrepancy reporting, equipment security and tracking test artifacts.

Test scripts served as the tool to achieve the main goal of validating the accuracy of the DRE equipment. Test scripts were designed to mimic actual voter experience. Each script represented the attributes of a voter (party affiliation, language choice) and specified a candidate for which the tester should vote in a specific contest. The test script form was laid out to record requisite details of the voting process for a "test voter" and served as a means to tally test votes and assist in verifying if all votes were properly recorded, summarized, and reported by the DRE unit.

For each county, 101 test scripts were developed. All contests, contest participants, voter demographics, script layouts and contents, and monitoring results were entered into a MS Access™ database. The database was a tool to manage 242 contests, over 1,000 contest participants and approximately 52,000 test voter selections from over 1,000 test scripts. The database also served as a tool to verify the accuracy and completeness of the test scripts.

Test Team Composition

Testing teams were comprised of 62 individuals including eighteen Secretary of State employees, twenty-three consultant testers and twenty-one video operators. With the exception of the video operators, each team member received 4.5 hours of Parallel Monitoring Program training. Team leaders received two additional hours of training specifically focused on team leader responsibilities.

Test Execution

Test teams were scheduled to arrive at their assigned county at varied times on the morning of November 2, 2004, to meet with county representatives, retrieve the voting equipment from storage, and be escorted to the testing room. Test teams followed a specific test schedule that identified set times of executing 101 test scripts on each DRE unit. The schedule provided for 9.25 hours of testing over a 13-hour period. All testing activity was video recorded.

During the course of the testing, the teams completed a Discrepancy Report for each deviation from the test script and/or test process and for any issues related to equipment malfunction.

At the completion of the testing, teams produced the closing tally report for their assigned DRE unit. The test teams did not reconcile the tally tapes in the field and had no knowledge of the expected outcomes.

Parallel Monitoring Program Results

The analysis of the data and the reconciliation of actual to expected results began on November 3, 2004. The analysis included a review of the Discrepancy Reports for all counties and the videotapes, as necessary, to determine the source of all discrepancies.

Results of the reconciliation analysis indicate that the DRE equipment tested on November 2, 2004 recorded the votes as cast with 100% accuracy.

Parallel Monitoring Program
November 2, 2004
Preliminary Report of Findings

I. Introduction

In March 2002 California voters enacted the Voting Modernization Bond Act, establishing a fund of $200 million for counties to upgrade voting equipment. Concurrently, the federal Help America Vote Act of 2002 (HAVA) was enacted by Congress and signed into law by the President requiring election reform and providing for some funding for improvements.

These actions provided incentives for counties to purchase Direct Recording Electronic (DRE) voting equipment, including touch screen voting systems. The adoption of DRE voting systems gave rise to public concerns about the security of these systems. The principle concern expressed has been the possibility that unauthorized programmers could illegally manipulate the software that records or counts ballots on DRE equipment.

In response to the above concerns, Secretary of State Kevin Shelley created the Ad Hoc Touch Screen Task Force on February 19, 2003 to study and make recommendations to the Secretary on possible improvements in the security of Direct Recording Electronic voting equipment. Among other recommendations the Task Force recommended:

> "Conducting random on-site sampling (otherwise known as 'parallel monitoring') of a specific number of machines on Election Day to confirm that each system in operation is registering votes accurately."

A. March 2004 Parallel Monitoring Program

On February 5, 2004, Secretary of State Kevin Shelley directed counties using DRE voting systems to take additional security measures for the March 2004 Primary Election. One of the required security measures was the conduct of a Parallel Monitoring Program to be performed under the auspices of the Secretary of State. The Parallel Monitoring Program would determine the accuracy of the machines to record, tabulate and report votes by randomly selecting a sample of DRE units to be set aside for testing by experts. The test would simulate actual voting conditions on Election Day to determine the accuracy of the machines to record, tabulate and report votes.

Members of the Secretary of State Elections Division staff, along with independent consultants, developed a Parallel Monitoring Program to implement the Secretary's directive for the March 2, 2004 Election. Eight of the fourteen counties using DREs in the election were selected for testing.

The March Parallel Monitoring Program Report is available on the Secretary of State's website.

B. The November 2, 2004 General Election Program

The Voting Systems and Procedures Panel, charged with making recommendations to the Secretary regarding voting systems, held a public hearing on April 21, 22 and 28, 2004, regarding the use of various voting systems in the November 2004 General Election. Following the hearing, Secretary Shelley decertified the Diebold AccuVote-TSx touch screen voting system used in four counties in the Primary. For the remaining counties using other DRE voting systems, the Secretary Shelley provided that those systems used in the March 2, 2004 Statewide Primary Election would be approved for use in the November 2, 2004 General Election if the counties complied with a set of conditions set forth in a Directive by his office dated April 30, 2004. One of the conditions for use of the DRE voting system included participation in the Parallel Monitoring Program.

In a memo of clarification, dated May 14, 2004, to the affected County Registrars of Voters, titled "Clarification of Conditions for using Electronic Voting Machines at the November 2004 Statewide General Elections", Secretary Shelley stated, in part:

> **"3. Parallel Monitoring** Following the procedures implemented at the March election, we will conduct parallel monitoring of voting systems at the November election. The monitoring will not involve taking any units out of service on Election Day. We will work with you to ensure that the monitoring does not interfere with the conduct of the election. Any costs will be borne by the Secretary of State's Office."

II. Parallel Monitoring Program Overview

A. Purpose

Current federal, state, and county accuracy testing of DRE voting systems occurs prior to elections and does not mirror actual voting conditions. This creates the potential that malicious code could be present that would be resistant to these test processes yet affect the accuracy of a system in any given Election Day. Examples of this type of tampering might include DRE units originally programmed to activate malicious code on a specific date (e.g. November 2, 2004) or code inserted into a particular DRE unit on Election Day to affect the outcome of a specific contest.

The Parallel Monitoring Program was developed as a supplement to current logic and accuracy testing processes. The goal is to determine the presence of malicious code by testing the accuracy of the machines to record, tabulate, and report votes using a sample of DRE equipment in selected counties under actual voting conditions on Election Day. An underlying assumption of the Program is that all DRE units from a particular vendor are programmed with the same code and, therefore, if malicious code were present on one DRE unit, it would be present on all of the DRE units in a given voting system. As such, only a small sample size is required to be tested on Election Day.

The Parallel Monitoring Program provides a "snapshot" of a specific Election Day. Thus the value of the Program is limited to the November 2, 2004 Election Day and would need to be repeated in future elections in order to provide this extra level of verification of DRE equipment and operation.

Parallel testing under actual voting conditions is intended to provide an additional level of verification that systemic malicious code is not present in the DRE voting systems. However, notwithstanding this additional level of testing, there are forms of malicious code that could affect the accuracy of a voting system that would not be detected by federal, state, local or parallel testing. Other detection methods, such as the Accessible Voter Verified Paper Audit Trail (AVVPAT), are necessary to expose these types of election tampering.

B. Program Scope

Eleven counties agreed to the conditions set forth in the Secretary's Directive and utilized DRE equipment for the November 2, 2004 election. Of these, one county—Los Angeles—was excluded from the Program because it used DRE equipment for their early voting program and did not use it in the precincts on Election Day. Two DRE units plus all necessary peripheral equipment were tested in each of the ten participating counties by a combination of independent consultants and Secretary of State staff. The participating counties were:

- Alameda
- Merced
- Napa
- Orange
- Plumas
- Riverside
- San Bernardino
- Santa Clara
- Shasta
- Tehama

The ten participating counties presented a sampling of the four different DRE systems currently approved for use in California: Diebold AccuVote-TS, ES&S iVotronic, Hart eSlate and Sequoia AVC Edge.

C. Program Prerequisites

Security of the testing process in each of the selected counties was of paramount consideration. In order to be successful, the Program required certain requisites:

1. The counties agree to the conditions set forth in the Secretary's Directive, dated April 30, 2004;
2. The counties agree to host testing teams on November 2, 2004;
3. Selection of voting equipment in each of the counties was randomly determined, utilizing random number generator computer software to eliminate human error or bias;
4. Voting equipment be fully operational, prepared for the November 2, 2004 Election by the county and accessible for selection prior to November 2nd and for testing on November 2nd;
5. A secure storage area be available at each county to house the selected voting equipment prior to November 2, 2004;
6. Tamper-evident, serially numbered security seals be placed on the selected voting machines;
7. A secure, appropriately equipped testing room be available at each county for the testing team on November 2, 2004;
8. A county representative be available to assist or provide guidance on logistical issues while the team was in the county prior to and on November 2, and;
9. Testing on November 2, 2004 be conducted by the testing teams without the involvement of voting system vendors.

One precinct in each county was selected for testing. The precinct was selected using a random number generator software tool. Once the precinct was identified, the county provided the official sample ballots for that precinct. The official ballot for the selected precinct provided the foundation for the development of test scripts for testing the DRE units in that county.

The counties were notified of the commencement of the Program by Secretary of State Elections Analyst Michael Wagaman on September 17, 2004.

The table below illustrates the counties, precincts and equipment designated to participate in the Program.

Test Counties, Precincts and Equipment

County	Consolidated Precinct	DRE Equipment	Card Activator
Alameda	42241-1	Diebold TS	Spyrus
Merced	313-1	ES&S iVotronic	Communications Pack
Napa	221018-00	Sequoia AVC Edge	Card Activator
Orange	0047269-1	Hart eSlate	Judges Booth Control
Plumas	42241-1	Diebold TS	Spyrus
Riverside	0044008-1	Sequoia AVC Edge	Card Activator
San Bernardino	161006.00	Sequoia AVC Edge	Card Activator
Santa Clara	0001873-1	Sequoia AVC Edge	Card Activator
Shasta	0000982-A	Sequoia AVC Edge	Card Activator
Tehama	50580-00	Sequoia AVC Edge	Card Activator

Table 1

D. Test Equipment Selection and Security

The DRE equipment to be tested in the counties was selected using one of two methodologies. For counties where the DRE equipment was pre-programmed and/or pre-assigned to a specific precinct, two units in the selected precinct were identified using a random number generator software tool. Where the DRE equipment was not pre-programmed and/or pre-assigned to a specific precinct, selection was accomplished by randomly selecting two numbers from the total number of DRE units in the county inventory using a random number generator software tool.

The exception to the above process was Riverside County. At the request of the county, one of the DRE units tested was randomly selected from those pre-assigned to the specific precinct using the process described above. The second unit was selected using a random number generator software tool from the supply of units the county had programmed and prepared to be sent to the precincts to replace units that became non-operational on Election Day.

The county does not have printers attached to the DRE units and therefore the tapes where generated from the memory cards at the Secretary of State's Office in Sacramento on November 4, 2004.

Representatives from the Secretary of State's Office traveled to and met with representatives from each county for the purpose of identifying and securing selected DRE equipment. The Secretary of State representatives identified the equipment using the methodology outlined above and documented the selection on the *Voting* System *Component Selection Form.* Secretary of State security seals were affixed to the equipment. The equipment was then segregated from the balance of the county inventory and secured and housed on the county premises until November 2, 2004. Encoders or voter card activators, voter access cards, supervisor cards and other items necessary for testing were also secured.

Table 2 below reflects the dates the equipment was secured in each county.

Dates Testing Equipment Secured

County	Representative	Testing Equipment	Testing Accessories	Date Secured
Alameda	Steve Kawano	Diebold TS, Spyrus	Voter Access Cards, Supervisor Card, DRE Keys, Encoder	10/14/2004
Merced	Steve Kawano	ES&S iVotronic, Communication Pack	None Required	10/26/2004
Napa	Steve Kawano	Sequoia Edge AVC, Card Activator	Voter Cards, Card Activator	10/22/2004
Orange	Michael Wagaman	Hart eSlate, JCB	None Required	10/21/2004
Plumas	Steve Kawano	Diebold TSx, PCM 500	Voter Access Cards, Supervisor Card, DRE Keys, Encoder	10/15/2004
Riverside	Michael Wagaman	Sequoia Edge AVC, Card Activator	Voter Cards, Card Activator	10/20/2004
San Bernardino	Michael Wagaman	Sequoia AVC Edge, Card Activator	Voter Cards, Card Activator	10/20/2004
Santa Clara	Steve Kawano	Sequoia Edge AVC, Card Activator	Voter Cards, Card Activator	10/22/2004
Shasta	Steve Kawano	Sequoia Edge AVC, Card Activator	Voter Cards, Card Activator	10/19/2004
Tehama	Steve Kawano	Sequoia Edge AVC, Card Activator	Voter Cards, Card Activator	10/25/2004

Table 2

E. Test Methodology

Procedures were created to provide a framework for: developing test scripts; defining the roles of the testers, training observers and team leaders; documenting testing activity and discrepancy reporting; documenting equipment security, and tracking test artifacts.

Test scripts served as the tool to achieve the main goal of validating the accuracy of the DRE equipment. The required accuracy of the equipment is defined in the Secretary of State's Task Force Report, as "precision in recording, calculations and outputs".

Test scripts were designed to mimic the actual voter experience. Each script represented the attributes of a voter (party affiliation, language choice) and specified a candidate for which the tester should vote in a specific contest. The test script form was laid out to record requisite details of the voting process for a "test voter" and served as a means to tally test votes and assist in verifying if all votes were properly recorded, compiled, and reported by the DRE unit.

For each county, 101 test scripts were developed. While the test scripts were different for each county—depending on the demographics and the local contests—within a county, both DRE teams executed the same 101 test scripts.

F. Database Development

All contests, contest participants, voter demographics, script layouts and contents, and monitoring results were entered into a MS Access™ database. The database was a tool to manage 242 contests, over 1,000 contest participants and approximately 52,000 test voter selections from over 1,000 test scripts.

The database also served as a tool to verify the accuracy and completeness of the test scripts. Reports were generated from data contained in the database to verify such things as:

- Coverage of all contests and contest participants
- Demographic profile of each precinct
- Voting patterns
- Contest drop-off rates
- Test "voter" selection corrections
- Language choice

- Write-In Candidates

G. Test Script Characteristics

Test scripts contained various numbers of contests per county including the following general election contests:

- Statewide: President and Vice-President, United States Senate, Propositions 1A, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, and 73
- Legislative: United State Representative, State Senate, State Assembly
- Local: Judicial, School, Transportation, County, City, and Local Measures

Coverage

Each set of scripts for a DRE contained the following coverage.

- Every contest available in the precinct was included on the script in at least 84% of the total number of scripts executed on each DRE
- Some, but not all, contests available in the precinct were included on the script in 15% of the total number of scripts
- No contest selections available in the precinct were included on the script in one ballot script for each county (Blank ballot)
- 100% of all contests received at least one test vote on the script in order to verify it was being tallied correctly.
- Attempt to use a voter access card more than once without reactivating the card

Demographic Profile and Voter Patterns

Test scripts were developed to mirror the actual distribution of voter demographics in a selected precinct and to ensure that the test scenarios matched actual ballot options for the General Election.

No provisional ballots were included in the test scripts as provisional ballots were not cast on DRE equipment in the November election following the conditions set forth by the Secretary of State's Office in a Directive dated April 30, 2004.

Test script selections were limited to the contests and contest candidates appropriate to the test voter's ballot type. A specific number of ballots

were allocated to each party based on voter registration data for the selected precinct. Of the total number of ballots allocated to a party (e.g. Democrat, Republican) the following arbitrary voter patterns applied:

- 60% of the ballots would "vote" straight party for partisan contests
- 25% of the ballots would "vote" straight party except for 1 to 3 contests for partisan contests which would provide for selections other than of that party
- 15% of the ballots would "vote" randomly for any party candidate for partisan contests

Contest Drop-off Rates

A study was conducted based on drop-off rates from previous California Statewide elections. Based on that study, each set of scripts for a DRE contained the following contest drop-off rates:

- 1% of the scripts will not have a vote for the Presidential contest
- 5% of the scripts will not have a vote for the US Senate contest
- 0-16% of the scripts will not have votes for all the Propositions (for an average 8% drop off)
- 7% of the scripts will not have a vote for the US Representative contest
- 9% of the scripts will not have a vote for the State Senate contest
- 10% of the scripts will not have a vote for the Assembly District contest

Test Voter Selection Correction

Each set of scripts for a DRE contained one each of the following common voter correction scenarios:

- Change a candidate selection on the same screen
- Change a candidate selection after advancing one screen
- Change a candidate selection after viewing the final summary/confirmation screen

Language Choice

Each set of scripts for a DRE provided for language choices as follows:

- Alameda – English, Spanish, Chinese
- Merced – English, Spanish
- Napa – English, Tagalog
- Orange – Tagalog, Chinese, Spanish, English, Korean, Vietnamese
- Plumas – English

- Riverside – Spanish, English
- San Bernardino – Spanish, English
- Santa Clara -- Tagalog, Chinese, Spanish, English, Vietnamese
- Shasta – English
- Tehama – English

Write-in Candidates

Each set of scripts for a DRE contained four (4) write-in candidates.

H. Test Script Components

Each test script consisted of the following components:

Section 1:

County – name of the county where the test was conducted. County name was preprinted on the form.

System vendor – the name of the vendor was preprinted on the form.

Precinct – the precinct number used to develop the test scripts. The precinct number was pre-printed on the form.

Tester – the name of the tester. Tester name was completed by the tester when the test script was initiated.

Observer – the name of the observer. Observer name was completed by the tester when the test script was initiated.

Video Operator – the name of the video operator. Video operator name was completed by the tester when the test script was initiated.

Time Block – the period of time in which the script was scheduled to be completed. Time block was pre-printed on the script.

Actual Start time – the actual time the script was initiated. Start time was filled in by the tester when the script was initiated.

Section 2:

Voting Language – the language to be activated for the test script The voting language was pre-printed on the script.

Section 3:

This section outlined the steps required to complete the test script:

Step 1 – instructed the tester to display the test script number so it was clearly visible to the video camera. This would facilitate the process of verifying anomalies through the review of the videotape.

Step 2 – instructed the tester to activate a voter access card or

code

Step 3 – instructed the tester to insert the voter access card into the DRE unit or, in the case of Orange County, to enter the access code

Step 4 – instructed the tester to vote for a candidate in each specified contest. When the tester made the selection on the screen, they would manually check the "select" box on the test script. Any deviation from the script would require a Discrepancy Report to be completed. The Discrepancy Report number was then recorded in the defect column.

Common voter errors.

Step 5 – instructed the tester to stop on the confirmation/review screen to allow for the observer to verify the tester's selections.

Step 6 – instructed the observer to review the selections against the script and:

- If the selection is correct, initial in the verify box
- If the selection is incorrect, the observer documents the defect by initialing in the "defect" column, informs the tester of the needed correction and completes a discrepancy form documenting the actions
- The tester then will correct the selection and again stop at the confirmation/review screen
- The observer again reviews the selections against the script

Step 7 – Once all selections are confirmed as correct, the tester is instructed to cast the ballot.

H. Test Team Composition and Training

Testing teams were comprised of 62 individuals including eighteen Secretary of State employees, twenty-three consultant testers and twenty-one video operators.

In seven of the ten counties, testing teams were comprised of a Secretary of State employee tester, a consultant tester and a video operator assigned to each of the two DRE to be tested. Due to the unique configuration of the Hart eSlate DRE system in Orange County, an additional testing team member was required. In Alameda and San Bernardino counties, a consultant was substituted for one Secretary of State employee.

With the exception of the video operators, each team member received 4.5 hours of Parallel Monitoring Program training. The training consisted of an overview of Secretary Shelley's directive regarding Parallel Monitoring Program, the objectives of the Program, an overview of the testing methodology and the required documentation, the roles and responsibilities of the testers and team leaders, a demonstration of each of the voting systems by the system vendors, security protocols and logistical information. In addition, team leaders received 2.5 hours of training specifically focused on pre-test and post-test equipment security, documenting testing activities, test artifact retention, additional security protocols, scheduled contact with the Project Manager, and protocols for interacting with county officials, employees and other observers.

In the event that a schedule team member was unable to participate in the test activity on November 2nd, three alternate consultants and two alternate Secretary of State employees were requested to attend the training session.

Team Member Roles and Responsibilities

Team members rotated between the roles of tester and observer.

The responsibility of the tester was to:

1. Read the test script carefully.
2. Record the information in Section 1 of the test script – Tester, Observer, Video Operator(s), Actual Start Time
3. Activate the voter access card in accordance with the test script (check for language choice)
4. Make voting selections on the screen in accordance with the test script
5. Verify each vote selection by checking the “verify” box on the script after EACH selection is made
6. Stop at the confirmation/review screen
7. Wait while the Observer checks the vote selections for consistency with the test script
    a. If the observer indicates a vote is inconsistent with the test script the observer will request the tester to make the appropriate correction
    b. Once the Observer indicates that all the selections are consistent with the test script, the observer will request the tester to proceed

8. Cast the ballot.

The responsibility of the observer is to:

1. Read the test script carefully
2. Verify that the voter access card is activated in accordance with the test script (verify language choice).
3. Verify that the vote selections made by the Tester are consistent with the test script.
    a. If vote selections are consistent with the test script, place a check in the "verify" box on the script for each vote and verbally indicate to the tester that he/she may proceed
    b. If vote selections are **not** consistent with the test script, document each vote selection that is incorrect by initialing the "defect" column on the script and requesting the tester to return to the appropriate screen and correct the vote selection.
4. Complete a Discrepancy Report and request the team leader to review and sign off on the report.
5. Request the Tester to move forward to the confirmation/review screen.
6. Review as noted above, verify that all vote selections made by the Tester are consistent with the test script and then verbally indicate to the Tester that he/she may proceed.
7. Observe the tester cast the ballot.

In addition to the above, one of the consultant testers in each county was designated the team leader with responsibility for oversight of all aspects of the testing process and for acting as liaison with the county officials.

The responsibility of the team leader was to:

1. Ensure that the voting system equipment is secure at all times and that at no times will there be fewer than three team members in the room with the equipment.
2. Ensure that Equipment Security and Chain of Custody forms are completed accurately and in a timely manner.
3. Ensure all pre- and post-test activities are completed according to the Activity Checklist.
4. Ensure the test scripts are executed correctly and consistent with the time schedule.
5. Ensure Discrepancy Reports and logs are completed correctly and

in a timely manner.

6. Ensure that all testing artifacts are collected, sealed, secured and returned to the Secretary of State.
7. Act as a liaison for contact with the county election personnel.
8. Initiate scheduled communications with the Secretary of State contacts.
9. Recognize and elevate issues, as appropriate.

Two video operators were at each county site. The video operators were given instructions to ensure the cameras captured all relevant activity.

The responsibilities of the video operators were to:

1. Record the pre-test activities including documenting the condition of the security labels, equipment set-up, printing of "zero tally report", and opening the polls.
2. Record execution of the test scripts.
3. Ensure that the video was clearly focused on the DRE units through the entire testing process, including breaks.
4. Ensure that the summary page was captured for each vote cast.
5. Record the post-test activities including closing the polls, printing "tally report", removal of memory card, and application of security labels.

G. Schedule of Activity for November 2, 2004

Test teams were scheduled to arrive at their assigned county at varied times on the morning of November 2, 2004, to meet with county representatives, retrieve the voting equipment from storage, and be escorted to the testing room.

A. Pre-Test Set-Up

From 6 a.m. to 7 a.m. each team was scheduled to:

- Coordinate with the video operator and ensure all relevant activity is recorded;
- Examine and document the condition of the tamper evident seals applied to the equipment using the Equipment Security and Chain of Custody form;
- Setup the DRE units and card activator equipment;
- Organize all equipment and supplies necessary to conduct the testing in a manner that would allow for executing the test scripts and provide a full view for the video camera;

- Generate the “zero tally” report for each DRE.

B. Executing the Test Scripts

Test teams were directed to follow a specific test execution schedule. The test schedule was developed based on voting trends. Therefore, more test scripts were to be executed during peak times. The first peak of the day was between 7:00 a.m. and 9:00 a.m., the second peak was between 11:45 a.m. and 1:30 p.m., and the last peak was between 5:00 p.m. and 8:00 p.m.

The team leaders were instructed to contact the Project Manager at Secretary of State headquarters at prescribed times: opening of the polls and initiation of testing, mid-morning, lunch break, mid-afternoon, dinner break, at the end of testing, and anytime a discrepancy disrupted the normal testing schedule.

The test schedule identifies set break times and set times of executing test scripts. Start and end times were printed on test scripts in order to facilitate adherence to the test schedule. The test schedule provided for 9.25 hours of testing.

Testing Schedule

Activity	Start	End	# Tests
Set-up	6:00 a	7:00 a	
Vote	**7:00 a**	**9:00 a**	**21**
Break	9:00 a	9:30 a	
Vote	**9:30 a**	**10:15 a**	**6**
Break	10:15 a	10:30 a	
Vote	**10:30 a**	**11:15 a**	**7**
Lunch	11:15 a	11:45 a	
Vote	**11:45 a**	**1:30 p**	**18**
Break	1:30 p	1:45 p	
Vote	**1:45 p**	**2:30 p**	**8**
Break	2:30 p	2:45	
Vote	**2:45 p**	**3:30**	**6**
Break	**3:30 p**	**3:45 p**	
Vote	**3:45 p**	**4:30 p**	**7**
Dinner	4:30 p	5:00 p	
Vote	**5:00 p**	**6:30 p**	**12**
Break	6:30 p	6:45 p	
Vote	**6:45 p**	**8:00 p**	**16**

Close	8:00 p	9:00 p	
		Total:	**101**

Table 3

C. Documenting Discrepancies

During the course of the testing, the teams completed a Discrepancy Report for each deviation from the test script and/or test process and for any issues related to equipment malfunction. Each Discrepancy Report was reviewed and signed by the team leader and logged on the Discrepancy Log Form. Discrepancy Reports were preprinted and numbered sequentially. Discrepancy Reports and Discrepancy Logs were returned to the Secretary of State along with all other testing artifacts when testing was completed.

D. Post-Testing Activities

Between 8 p.m. and 9 p.m., the teams ran the closing tally tape for their DRE equipment; secured the DRE equipment with security seals; documented the security seal numbers; collected, inventoried and verified labels on all video tapes; completed the *Test Artifacts Checklist* form ensuring all required items are collected and sealed for return to the Secretary of State, returned the equipment to a secure location where the equipment will be stored until directed by the Secretary of State.

The exception to the above process was Riverside County. The county does not have printers attached to the DRE units; and, therefore the tapes were generated from the memory cards at the Secretary of State's Office in Sacramento on November 4, 2004.

The test teams did not reconcile the tally tapes and had no knowledge of the expected outcomes.

II. Reconciling the Testing Results

Team leaders returned test artifacts to the Secretary of State's Office in Sacramento on November 3, 2004. Each team leader met with the Project Manager and provided a briefing on how the testing proceeded in their assigned county, reviewed the inventory of artifacts, discussed each Discrepancy Report in detail, and reviewed the required documentation to ensure all had been completed correctly and that the Project Manager understood all situations that had prompted the completion of a Discrepancy Report.

Test artifacts included the hardcopy tally printouts from the DRE equipment recording the results of the "test voting" for the day. Some DRE equipment had a printout for each DRE, while other DRE equipment generated a consolidated printout for both DRE units.

The analysis of the data and the reconciliation of actual results to expected results included the following tasks:

1. The DRE printouts from each unit, or the consolidated tape, were compared to the expected baseline tally figures from the Access™ database to identify inconsistencies between the actual results and the expected baseline tally figures.

2. Discrepancy Reports were reviewed and analyzed to determine what, if any, impact the described discrepancy would have on the actual results.

   For example, a test script instructs the tester to vote for a candidate two times, but the tester votes only once, and documents the discrepancy. During the reconciliation process a review of the totals shows the actual total differs by one from the expected total. The analyst reviews the Discrepancy Report that documents the deviation from the test script. This triggers a review of the specific test script, which confirms that the test script called for the tester to vote for a candidate two times, in error. The cause of the discrepancy is a test script error.

3. Anomalies documented in Discrepancy Reports were verified by completing a review of the test scripts.

4. If a discrepancy was not resolved by a review of the test scripts, the videotapes of the testing were analyzed. If the source of the anomaly was identified through a review of the videotape, a Discrepancy Report was completed.

   For example, a test script instructs the tester to activate a voter access card and specifies the contests and candidates to select. The tester activates a voter card then votes the ballot as specified by the test script. During the reconciliation process a review of the totals shows the actual total is off by one from the expected total in two categories. The analyst reviews the Discrepancy Reports and notes that there are no Discrepancy Reports that explain this difference. This triggers a review and analysis of the videotapes. The video reveals the tester voting “yes” for Proposition 60 on test script number that instructed the tester to vote “no” for Proposition 60. The videotape reveals the source of the error. The analyst completes a Discrepancy Report noting the test script number, the error and the impact on the expected results. The cause of the discrepancy is a tester error. A Discrepancy Report is completed describing the incident.

5. There were additional discrepancy forms completed in each of the counties that did not affect the actual results. These discrepancy forms usually related to testers making corrections to selections before casting the ballot, testers having to “tap” multiple times to make the selection record on the DRE unit or short testing delays due to changing tapes for the video recordings.

III. Parallel Monitoring Program Findings

Results of the reconciliation analysis indicate that the DRE equipment tested on November 2, 2004 recorded the votes as cast with 100% accuracy.

In six counties—Alameda, Napa, San Bernardino, Shasta, Tehama, and Riverside—the results matched exactly for all contests and no further analysis was required to reconcile the results.

For the remaining four counties—Merced, Orange, Plumas and Santa Clara—variations remained which could not be explained by the Discrepancy Reports completed during the testing. In these cases, the video recordings were analyzed. In all cases the analysis revealed the source of the discrepancies to be tester error.

A. Analysis and Results by County

This section provides the details of the analysis and specific test results for each county. Each county analysis is divided into three sections. Section 1 describes any variations from the test methodology, section 2 describes the comparison of the expected and the actual results and section 3 describes the process undertaken to determine the source of the discrepancies.

1. **Alameda County**

   a) Variations in Test Methodology:

      (1) Opening of Polls - Due to a delay in entering the testing room, testing did not begin until 7:10 AM.

      (2) Storage of Test Artifacts - After sealing the memory cards in bags and using seals provided by the Secretary of State's Office, the memory cards were locked in a secure location by a representative of the County. In the morning a representative of the Secretary of State's Office verified the seals were intact. The artifacts were then returned to the Secretary of State's Office without leaving the custody of the office's representative.

   b) Comparison of Expected and Actual Results:

      After the comparison of the expected and actual results, a total of zero discrepancies were identified.

   c) Reconciliation of Discrepancies:

      No reconciliation was necessary.

2. **Merced County**

   a) Variations in Test Methodology:

      Opening of Polls - Due to a delay in securing access to the testing room, testing did not begin until 7:30 a.m.

b) Comparison of Expected and Actual Results:

After the initial comparison of the expected and actual results, a total of six discrepancies were identified.

c) Reconciliation of Discrepancies

None of the Discrepancy Reports completed on November 2nd resolved the identified variations.

The following Discrepancy Reports were completed after review of testing videotapes and identified the source of remaining variations from the expected results:

(1) Report #17 –Tester Error: The tester improperly cast a "no" vote instead of a "yes" vote on Proposition 68. This resolved two discrepancies.

(2) Report #18 –Tester Error: The tester improperly cast a "yes" vote instead of a "no" vote on Proposition 67. This resolved two discrepancies.

(3) Report #19 –Tester Error: The tester correctly "tapped" the screen to select candidate "Bush" for President however on the screen candidate "Peroutka" was highlighted and the ballot recorded for him. This resolved two discrepancies. The cause of the improper candidate being selected is being investigated.

3. **Napa County**

a) Variations in Test Methodology:

Opening of Polls - The County did not permit the Team to enter the county until 6:45 a.m., therefore testing did not begin until 7:39 AM.

b) Comparison of Expected and Actual Results:

After the comparison of the expected and actual results, a total of zero discrepancies were identified.

c) Reconciliation of Discrepancies:

No reconciliation was necessary.

4. **Orange County**

a) Variations in Test Methodology:

(1) Team Membership – Due to the unique configuration of the system an additional team member was assigned to operate and monitor the Judges Booth Control (JBC). An additional

video camera was set up to record the JBC.

(2) The selected precinct did not provide a ballot definition with the option of selecting Tagalog as a language choice. The script instructing the voter to select Tagalog was voted in English.

b) Comparison of Expected and Actual Results:

After the initial comparison of the expected and actual results, a total of two discrepancies were identified.

c) Reconciliation of Discrepancies

The following Discrepancy Reports were completed after review of the videotapes and identification of the source of the two discrepancies from the expected results:

(1) Report #15 and 16 –Tester Error: The tester improperly selected Gary G. Miller for US House of Representatives when the script instructed a selection of Gary V. Miller for School Trustee. This resolved two discrepancies.

5. **Plumas County**

a) Variations in Test Methodology:

No variations in test methodology occurred.

b) Comparison of Expected and Actual Results:

After the initial comparison of the expected and actual results, a total of twenty-three discrepancies were identified.

c) Reconciliation of Discrepancies

The following Discrepancy Report was completed during the testing and adequately identified the source of twenty-one variations:

Report #2 –Tester Error: One team of testers voted only for propositions and did not vote for any candidates on the first 19 scripts. This resolved twenty-one discrepancies.

The following Discrepancy Reports were completed after review of the videotapes and identification of the source of the remaining discrepancies:

Report #14 – Tester Error: The tester improperly cast a "yes" vote instead of a "no" vote on Proposition 60. This resolved two discrepancies.

6. **Riverside County**

   a) Variations in Test Methodology:

      (1) Review screen for the Spanish language choice ballot did not allow for confirmation of proposition selections. The county has identified that the cause of this variation was human-error in defining the ballot definition.

      (2) Equipment did not show contest totals on screen for video recording.

   b) Comparison of Expected and Actual Results:

      After the comparison of the expected and actual results, a total of zero discrepancies were identified.

   c) Reconciliation of Discrepancies:

      No reconciliation was necessary.

7. **San Bernardino**

   a) Variations in Test Methodology:

      Opening of Polls - Due to the video operators being late, the testing began at 7:05 a.m.

   b) Comparison of Expected and Actual Results:

      After the comparison of the expected and actual results, a total of zero discrepancies were identified.

   c) Reconciliation of Discrepancies:

      No reconciliation was necessary.

8. **Santa Clara County**

   a) Variations in Test Methodology

      No variations in test methodology occurred.

   b) Comparison of Expected and Actual Results.

      After the initial comparison of the expected and actual results, it was determined that the total ballots cast was off by one script.

c) Reconciliation of Discrepancies

The following Discrepancy Report was completed after review of the test scripts and videotapes:

Report #48 – Tester Error: A review of the test scripts identified one test script (test script #80) that included none of the required notations (i.e., tester names, start time, selection and verification sign off). A review of the shows the tester executing test 79 and then 81. Test script 80 was inadvertently skipped and this caused all the discrepancies.

9. **Shasta County**

a) Variations in Test Methodology:

No variations in test methodology occurred.

b) Comparison of Expected and Actual Results:

After the comparison of the expected and actual results, a total of zero discrepancies were identified.

c) Reconciliation of Discrepancies:

No reconciliation was necessary.

10. **Tehama County**

a) Variations in Test Methodology:

No variations in test methodology occurred.

b) Comparison of Expected and Actual Results:

After the comparison of the expected and actual results, a total of zero discrepancies were identified.

c) Reconciliation of Discrepancies:

No reconciliation was necessary.